

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

Armin KUEBELBECK

Examiner: Pegah Parvini

Serial No.: 10/592,017

Group Art Unit: 1793

Filed: September 7, 2006

Title: PROCESS FOR THE PRODUCTION ON MONODISPERSE  $\text{SiO}_2$   
PARTICLES

**BRIEF ON APPEAL UNDER 37 C.F.R. §41.37**

**MAIL STOP: APPEAL BRIEF - PATENTS**

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Further to the Notice of Appeal filed September 17, 2009, attached herewith is Appellants' Brief on Appeal, pursuant to 37 CFR §41.20(b)(2). This is an appeal from the decision of the Examiner finally rejecting claims 1, 2, and 6-28 in the Office Action issued March 17, 2009.

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

**(1) REAL PARTY IN INTEREST**

The application is assigned of record to Merck Patent GmbH, who is the real party in interest herein. The assignment is recorded at Reel 018299/Frame 0351.

## **(2) RELATED APPEALS AND INTERFERENCES**

Appellants, their legal representative and the assignee are not aware of any related appeals or interferences which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the instant appeal.

## **(3) STATUS OF THE CLAIMS**

Claims rejected: 1, 2, and 6-28;

Claims allowed: None;

Claims canceled: 3-5;

Claims withdrawn: None;

Claims objected to: None;

Claims on Appeal: 1, 2, and 6-28. A copy of the claims on appeal is provided in the attached Claim Appendix.

## **(4) STATUS OF AMENDMENTS AFTER FINAL**

Subsequent to the Final Office Action issued March 17, 2009, appellants filed a "Reply Under 37 CFR 1.116" on September 17, 2009, in which claim amendments were presented. These amendments have been entered as indicated in the Advisory Action issued October 1, 2009.

## **(5) SUMMARY OF THE CLAIMED SUBJECT MATTER**

The claimed subject matter includes both a process (see, e.g., claim 1) and a product-by-process (see claim 19). As recited in independent claim 1, the process according to the invention is for the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes. See, for example, page 3, lines 6-11 of the specification. The process comprises conducting hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes in a medium comprising water, one or more solubilizers, and ethanolamine. See, for example, page 3, lines 6-11, page 5, lines 17-19, and page 15, lines 19-30.

The product-by-process aspect of the invention, as recited in claim 19, is a material for use as sorption material in chromatography, in isolation and purification of nucleic acids and proteins, in phagocytosis analyses, as constituents in diagnostic arrays, as solid phases for the investigation of molecular recognition phenomena, as solid phases in heterogeneously catalysed processes, as a component of photonic crystals, or as lubricants and/or polishing agents. See page 3, lines 13-20. The material is a product obtained by the process according to claim 1. See, for example, page 3, lines 6-11, page 5, lines 17-19, and page 15, lines 19-30.

#### **(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

The grounds of rejections on Appeal are:

- (1) whether claims 1, 6-19, and 21-28 are obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763) and Su (US 5,932,168).
- (2) whether claim 2 is obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763), Su (US 5,932,168), and Anselmann et al. (US 6,302,926);
- (3) whether claims 1 and 6-28 are obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763) and Blizzard et al. (US 5,626,964);
- (4) whether claim 2 is obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763), Blizzard et al. (US 5,626,964), and Anselmann et al. (US 6,302,926);
- (5): whether claim 19 is obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564), Blizzard et al. (US 5,626,964), and Teller et al. (EP 1 036 763)
- (6) whether claims 1, 6-8, 10-18, 20-21, and 24-28 are obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564) and Blizzard et al. (US 5,626,964);
- (7) whether claim 2 is obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564), Blizzard et al. (US 5,626,964), and Anselmann et al. (US 6,302,926);
- (8) whether claims 1, 2, 7-9, 17-19, and 22-23 are obvious under 35 USC 103(a) in view of Unger et al. (US 4,775,520) and Blizzard et al. (US 5,626,964); and
- (9) whether claims 10-16 and 24-26 are obvious under 35 USC 103(a) in view of Unger et al. (US 4,775,520), Blizzard et al. (US 5,626,964), and Trau et al. (US 2003/0124564).

In the Advisory Action issued October 1, 2009, it is stated that the rejections based on “Trau et al. in view of Su and Unger et al. in view of Su” have been overcome. Based on this statement, appellants have assumed that the following rejections also have been withdrawn:

(1) the rejection based on Trau et al. (US 2003/0124564), Su (US 5,932,168), and Anselmann et al. (US 6,302,926);

(2) the rejection based on Trau et al. (US 2003/0124564), Su (US 5,932,168), and Teller et al. (EP 1 036 763); and

(3) the rejection based on Unger et al. (US 4,775,520), Su (US 5,932,168), and Trau et al. (US 2003/0124564).

## **(7) APPELLANTS' ARGUMENTS**

### **(I) Rejection under 35 USC 103(a) in view of Teller et al. and Su**

Claims 1, 6-19, and 21-28 are rejected as being obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763) and Su (US 5,932,168).

This rejection was initially presented in the Final Office Action issued March 17, 2009. This rejection was not applied against claim 4. In the Reply Under 37 CFR 1.116 filed September 17, 2009, claim 1 was amended to incorporate the recitation of claim 4. Entry of the amendment was confirmed in the Advisory Action issued October 1, 2009.

Therefore, this rejection was rendered moot by the amendment to claim 1 incorporating the recitation of claim 4. However, the Advisory Action of October 1, 2009 did not indicate that this rejection was withdrawn. Thus, while appellants assume that the Examiner intended to withdraw this rejection, a traversal is presented here for the sake of completeness.

#### **A. Teller et al. (EP 1 036 763)**

In the rejection as presented in the March 17, 2009 Final Office Action, it is asserted that Teller et al. (EP 1 036 763) disclose a process comprising many of the features of the claimed process. Since the Teller et al. document is in German and no English translation was provided, appellants' counsel could not comment on these assertions. Thus, counsel

requested that, if the rejection were to be maintained, that an English translation of Teller et al. disclosure be provided. Presently, there is no English translation of Teller et al. disclosure of record.

The disclosure of Teller et al. (EP '763) is discussed in appellants' specification at page 2, wherein it is stated that EP '763 discloses a process for production of colored and fluorescent polysilicic acid particles in which ammonia is used as the main component in a hydrolytic polycondensation.

It is acknowledged in the rejection that Teller et al. do not disclose the use of ethanolamine or ethylenediamine as a base in their polycondensation hydrolysis process. See the top of page 4 of the March 17, 2009 Final Office Action. With regards to this aspect, the rejection relies on the disclosure of Su (US 5,932,168).

B. Su (US 5,932,168)

Su (US '168) disclose a process for making a mullite composition comprising mixing an alkoxysilane and a base in water to form a mixture. The mixture is stirred to form a silica sol, and then an aqueous aluminum solution is added to keep the silica dispersed. The sol is then stirred to form a mullite precursor sol. See column 4, lines 1-8.

In the rejection, reference is made to the disclosure by Su at column 5, lines 40-67. In this portion of the disclosure, Su describes the alkoxysilanes and bases that can be used to form the initial mixture. The bases mentioned are "ammonium hydroxide, diethylamine, dimethylamine, N-(2-hydroxyethyl)ethylenediamine, trimethanolamine, triethanolamine, bis-(2-hydroxyethyl)butylamine, allylmethylamine, butyldimethylamine, dibutylmethylamine, 2,2',2''-trihydroxyamine, or combinations thereof, with ammonium hydroxide being preferred."

Su does not mention ethanolamine. Nor does Su suggest the type of bases to be used in the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilane.

Additionally, it is argued in the rejection that "since Teller et al. do not disclose the production of porous particles, therefore, it is seen to read on the instant limitation (i.e. non-porous silica)." See the bottom of page 3 of the March 17, 2009 Final Office Action. Appellants disagree with the assertion that, merely because Teller et al. do not expressly

disclose that their particles are porous, one can definitively conclude that the particles produced by Teller et al. are non-porous. The absence of a feature in a disclosure does not constitute an express disclosure of the opposite feature.

In view of the above remarks, it is respectfully submitted that the disclosure of Teller et al., taken alone or in combination with the disclosure by Su, fails to render obvious appellants' claimed invention.

## **II. Rejection under 35 USC 103(a) in view of Teller et al., Su and Anselmann et al.**

Claim 2 is rejected as being obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763), Su (US 5,932,168), and Anselmann et al. (US 6,302,926). This rejection is respectfully traversed.

As with the previous rejection, the instant rejection was initially presented in the Final Office Action issued March 17, 2009. This rejection was also not applied against claim 4. Therefore, this rejection was also rendered moot by the amendment to claim 1 incorporating the recitation of claim 4 in the Reply Under 37 CFR 1.116 filed September 17, 2009.

However, the Advisory Action of October 1, 2009 did not indicate that this rejection was withdrawn. Thus, while appellants assume that the Examiner intended to withdrawal this rejection, a traversal is presented here for the sake of completeness.

The disclosures of Teller et al. and Su. are discussed above. Anselmann et al. disclose preparations comprising: (a) 70 to 95% by weight of monodisperse spherical oxide particles that have particle diameters of 10 nm - 10  $\mu$ m, and (b) 30 to 5% by weight of an essentially non-volatile binder in the form of a free-flowing powder of agglomerates having diameters of 1  $\mu$ m - 500  $\mu$ m. See column 2, lines 1-8.

Anselmann et al. also describe a two-stage process for preparing SiO<sub>2</sub> particles wherein first a sol or a suspension of primary particles is prepared by hydrolytic polycondensation of tetraalkoxysilanes in an aqueous-alcoholic-ammoniacal medium. Next, the particles are brought to a desired final size by metered addition of tetraalkoxysilane. See column 3, lines 3-8.

Anselmann et al. do not disclose a process wherein hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes is performed in a medium comprising water, one or more solubilizers, and an amine, namely ethanolamine. Nor do Anselmann et al.

suggest metered addition of tetraalkoxysilane in a process involving hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes in the presence of ethanolamine.

As noted above, Anselmann et al. use an aqueous-alcoholic-ammoniacal medium which has several disadvantages as described in appellants' specification. See, e.g., page 2, lines 13-30 of the specification.

Additionally, the disclosure of Anselmann et al. does not overcome the deficiencies in the combination of Teller et al. and Su, as discussed above.

In view of the above remarks, it is respectfully submitted that the disclosure of Teller et al., taken alone or in combination with the disclosure by Su and/or Anselmann et al., fails to render obvious appellants' claimed invention.

### **III. Rejection under 35 USC 103(a) in view of Teller et al. and Blizzard et al.**

Claims 1 and 6-28 are rejected as being obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763) and Blizzard et al. (US 5,626,964).

#### **A. Teller et al. (EP 1 036 763)**

In the rejection as presented in the March 17, 2009 Final Office Action, it is asserted that Teller et al. (EP 1 036 763) disclose a process comprising many of the features of the claimed process. As mentioned previously, the Teller et al. document is in German and no English translation has been provided. Thus, appellants' counsel can not comment on these assertions.

The disclosure of Teller et al. (EP '763) is discussed in appellants' specification at page 2, wherein it is stated that EP '763 discloses a process for production of colored and fluorescent polysilicic acid particles in which ammonia is used as the main component in a hydrolytic polycondensation.

It is acknowledged in the rejection that Teller et al. do not disclose the use of ethanolamine or ethylenediamine as a base in their polycondensation hydrolysis process. See the top of page 4 of the March 17, 2009 Final Office Action. With regards to this aspect, the rejection relies on the disclosure of Blizzard et al. (US 5,626,964).

B. Blizzard et al. (US 5,626,964)

Contrary to the disclosure of Teller et al., Blizzard et al. is not directed to the production of production of polysilicic acid particles by hydrolytic polycondensation. Instead, Blizzard et al. disclose a radiation-curable silicone resin composition which is said to exhibit substantial abrasion resistance and which utilizes an Si-O-C bond in the structure of the resin network. The composition comprises the reaction product of:

(A) at least one multifunctional acrylate selected from multifunctional acrylate monomers and oligomers having a predetermined sum of methacrylate and acrylate groups;

(B) a predetermined quantity of a tetra-alkoxysilane;

(C) at least one amine alcohol having at least one nucleophilic nitrogen-bonded hydrogen atom and at least one hydroxyl group per molecule, wherein the hydroxyl group is condensable with a hydrolyzate formed from the tetra-alkoxysilane (B), and the amine alcohol is present in a quantity that defines a predetermined number of nucleophilic nitrogen-bonded hydrogen atoms, the ratio of the predetermined number sum of acrylate and methacrylate groups to the predetermined number of nucleophilic nitrogen-bonded hydrogen atoms being at least about 1:1; and

(D) a quantity of water sufficient to cause hydrolysis and condensation of the tetra-alkoxysilane (A) without gelling the combination of components (A)-(D) or causing a precipitate to form.

Thus, the disclosure of Blizzard et al. is directed to the formation of a radiation curable silicone resin from an amine alcohol, a tetralkoxysilane, and a multifunctional acrylate. The disclosure of Blizzard et al. is not directed to formation of mono-dispersed polysilicic acid particles, and therefore provides no indication as to how or why one would modify a process for production of mono-dispersed polysilicic acid particles.

As can be seen from the description of the Blizzard et al. composition, the amount of the amine alcohol used is tied to the amount of multifunctional acrylate used. Specifically, the ratio of the predetermined number sum of acrylate and methacrylate groups from the multifunctional acrylate to the predetermined number of nucleophilic nitrogen-bonded hydrogen atoms from the amine alcohol is at least about 1:1. This is due to the fact that the function of the amine alcohol is to form a Michael adduct with the acrylate/methacrylate groups. See column 6, lines 13-28, column 6, lines 37-41, and column 7, lines 5-20.



Thus, the disclosure of Blizzard et al. teaches the use of an amine alcohol as an agent for forming a Michael adduct with a multifunctional acrylate. However, the Teller et al. reaction medium does not contain a multifunctional acrylate. Therefore, Blizzard et al. provide no suggestion of modifying the process of Teller et al. so as to use an amine alcohol in the reaction medium.

Additionally, in the rejection it is asserted that Blizzard et al. disclose the use pentaerythritol tetra-acrylate (see, e.g., Example 1), and that this compound is a ketone and therefore a solubilizer. However, Blizzard et al. do not employ pentaerythritol tetra-acrylate as a solubilizer, and one of ordinary skill in the art upon reading the disclosure of Blizzard et al. would not assume that this compound is a solubilizer.

In the reaction medium of Blizzard et al., it is evident that the pentaerythritol tetra-acrylate acts as the multifunctional acrylate. In addition to forming a Michael adduct with the amine alcohol, the pentaerythritol tetra-acrylate, acting as part of the Michael adduct, will undergo copolymerization with the tetra-alkoxysilane hydrolyzate, thereby resulting in the formation of the silicone resin, **not mono-dispersed polysilicic acid particles**. See, e.g., column 6, lines 54-62.

The rejection asserts that based on the disclosures of Teller et al. and Blizzard et al., ammonia and ethanolamine are functionally equivalent. However, nothing within the rejection indicates that either Teller et al. or Blizzard et al. teach that ammonia and ethanolamine are functionally equivalent. The process of Blizzard et al. is clearly different than that of Teller et al. resulting in a different product. The Blizzard et al. disclosure clearly does not suggest that the alcohol amines disclosed therein are equivalent to ammonia used in a completely different process, such as the process disclosed by Teller et al. Neither Teller et al. nor Blizzard et al. disclose that ammonia and ethanolamine are equivalent bases for any particular use.

Further, it is noted that bases are not “equivalent” for the process of appellants’ claimed invention. See, for example, the results of appellants’ Example 1, presented in Table 1 at page 15 of the specification. While ethanolamine and ethylenediamine provided monodisperse particles, other amines like triethylamine, octylamine, and tetramethylammonium hydroxide did not.

In the Advisory Action of October 1, 2009, the Examiner argues that the processes of

Teller et al. and Blizzard et al. show that “ethanolamine and ammonia impart similar effects and properties.” Appellants disagree. The function of ethanolamine in the process of Blizzard et al. as an agent for forming a Michael adduct is different than the function of ammonia in the process of Teller et al. Furthermore, the formation of the Michael adduct in the process of Blizzard et al. results in the formation of a very different product than the product produced by the process of Teller et al.

Regarding the results in appellants’ Table 1, the Advisory Action asserts that mono-dispersed particles can be obtained using ammonia. The use of ammonia has many disadvantages as discussed in appellants’ specification. See pages 2-3. In any event, the results in appellants’ Table 1 show that bases are not “equivalent” for the process of appellants’ claimed invention.

Additionally, it is argued in the rejection that “since Teller et al. do not disclose the production of porous particles, therefore, it is seen to read on the instant limitation (i.e. non-porous silica).” See the top of page 8 of the March 17, 2009 Final Office Action. Appellants disagree with the assertion that, merely because Teller et al. do not expressly disclose that their particles are porous, one can definitively conclude that the particles produced by Teller et al. are non-porous. The absence of a feature in a disclosure does not constitute an express disclosure of the opposite feature.

In the Advisory Action of October 1, 2009, the Examiner argues that “Blizzard et al., as clearly shown, was used for their teaching on the use of ethanolamine in a very similar process.” However, the processes of Teller et al. and Blizzard et al. are very different. The process of Teller et al. is directed to the production of polysilicic acid particles by hydrolytic polycondensation. The process of Blizzard et al. is directed to the production of a radiation-curable silicone resin composition. The process of Blizzard et al. involves the use of a multifunctional acrylate to form a Michael adduct. The process of Teller et al. does not use a multifunctional acrylate and does not form a Michael adduct. The process of Teller et al. uses ammonia as the main component in a hydrolytic polycondensation. The process of Blizzard et al. uses an amine alcohol to form a Michael adduct with a multifunctional acrylate.

It is also argued in the Advisory Action of October 1, 2009 that “one cannot show non-obviousness by attacking references individually where the rejections are based on the combinations of references.” Appellants are not attacking the references individually, but are

instead presenting arguments why one skilled in the art would not combine the disclosures and why one skilled in the art would not modify the process of the primary reference, based on the disclosure of the secondary reference, in the manner suggested by the rejection.

Further, it is argued in the Advisory Action of October 1, 2009 that, to be used in a rejection, the prior art reference must be in the same field of endeavor as applicants' invention or be reasonably pertinent to the particular problem. The Blizzard et al. disclosure is not in the relevant field of endeavor in that it is not related to the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes. Further, the formation of a Michael adduct, as described by Blizzard et al., is not reasonably pertinent to appellants' particular problem, or that of Teller et al.

Responding to appellants' argument that Blizzard et al. do not employ pentaerythritol tetra-acrylate as a solubilizer, the Advisory Action asserts that this compound would be "expected to impart the same effect and have the same properties." However, neither Teller et al. nor Blizzard et al. disclose the compound as a solubilizer. Thus, these two disclosures do not provide an expectation as to this effect.

In view of the above remarks, it is respectfully submitted that the disclosure of Teller et al., taken alone or in combination with the disclosure by Blizzard et al., fails to render obvious appellants' claimed invention.

#### **IV. Rejection under 35 USC 103(a) in view of Teller et al., Blizzard et al. and Anselmann et al.**

Claim 2 is rejected as being obvious under 35 USC 103(a) in view of Teller et al. (EP 1 036 763), Blizzard et al. (US 5,626,964), and Anselmann et al. (US 6,302,926). This rejection is respectfully traversed.

The disclosures of Teller et al., Blizzard et al., and Anselmann et al. are discussed above.

Anselmann et al. disclose preparations comprising: (a) 70 to 95% by weight of monodisperse spherical oxide particles that have particle diameters of 10 nm - 10 µm, and (b) 30 to 5% by weight of an essentially non-volatile binder in the form of a free-flowing powder of agglomerates having diameters of 1 µm - 500 µm. See column 2, lines 1-8.

Anselmann et al. also describe a two-stage process for preparing SiO<sub>2</sub> particles wherein first a sol or a suspension of primary particles is prepared by hydrolytic polycondensation of tetraalkoxysilanes in an aqueous-alcoholic-ammoniacal medium. Next, the particles are brought to a desired final size by metered addition of tetraalkoxysilane. See column 3, lines 3-8.

Anselmann et al. do not disclose a process wherein hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes is performed in a medium comprising water, one or more solubilizers, and an amine, namely ethanolamine. Nor do Anselmann et al. suggest metered addition of tetraalkoxysilane in a process involving hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes in the presence of ethanolamine.

As noted above, Anselmann et al. use an aqueous-alcoholic-ammoniacal medium which has several disadvantages as described in appellants' specification. See, e.g., page 2, lines 13-30.

Additionally, the disclosure of Anselmann et al. does not overcome the deficiencies in the combination of Teller et al. and Blizzard et al., as discussed above.

In view of the above remarks, it is respectfully submitted that the disclosure of Teller et al., taken alone or in combination with the disclosure by Blizzard et al. and/or Anselmann et al., fails to render obvious appellants' claimed invention.

**V. Rejection under 35 USC 103(a) in view of Trau et al. and Blizzard et al.**

Claims 1, 4, 6-8, 10-18, 20-21, and 24-28 are rejected as being obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564) and Blizzard et al. (US 5,626,964).

**A. Trau et al. (US 2003/0124564)**

The rejection refers to paragraphs [0010]-[0012] of Trau et al. In this portion of the disclosure, Trau et al. describe a method, known as the Stober process, for synthesizing colloidal silica. In this process, tetraethyl orthosilicate is subjected to hydrolysis in a solution of ethanol, water, and ammonia. The hydrolysis of tetraethyl orthosilicate forms reactive silanol groups, and the silanol groups condense to form a polymer chain. As the polymer chain increases, polymer solubility decreases and the polymer precipitates as colloiddally

unstable, nano-sized, silica particles. These particles are said to aggregate to form larger particles that are monodisperse.

Trau et al. also disclose that in the Stober process fluorescent dyes can be incorporated into the silica network. They are incorporated via silane coupling agents, such as 3-aminopropyl trimethoxysilane (APS), which react with isothiocyanate modified dyes to form fluorescent silane monomers.

At paragraph [0013], Trau et al. disclose disadvantages associated with the Stober process. Trau et al. state that the particles obtained are limited to a maximum size of about 3 microns, and the resultant particles have limited porosities.

The inventive process of Trau et al. is described in paragraph [0020]. This process is directed to synthesizing porous organosilica spherical particles and comprises the steps of mixing acid, water, and a silane derivative containing a functional group to form a hydrolyzed silane emulsion. Thereafter, a cross-linker catalyst is added to the emulsion to provide cross-linking.

Trau et al. do not disclose a process wherein hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes is performed in a medium comprising water, one or more solubilizers, and an amine, namely ethanolamine.

**B. Blizzard et al. (US 5,626,964)**

The disclosure of Blizzard et al. is discussed above. Blizzard et al. is directed to the formation of a radiation curable silicone resin from an amine alcohol, a tetraalkoxysilane, and a multifunctional acrylate. Blizzard et al. is not directed to the formation of mono-dispersed polysilicic acid particles, and therefore provides no indication as to how or why one would modify a process for the production mono-dispersed polysilicic acid particles.

Furthermore, the disclosure of Blizzard et al. teaches the use of an amine alcohol as an agent for forming a Michael adduct with a multifunctional acrylate. However, the Trau et al. reaction medium does not contain a multifunctional acrylate. Therefore, Blizzard et al. provide no suggestion of modifying the process of Trau et al. so as to use an amine alcohol in the reaction medium.

Additionally, in the rejection it is asserted that Blizzard et al. disclose the use pentaerythritol tetra-acrylate (see, e.g., Example 1), and that this compound is a ketone and

therefore a solubilizer. However, Blizzard et al. do not employ pentaerythritol tetra-acrylate as a solubilizer, and one of ordinary skill in the art upon reading the disclosure of Blizzard et al. would not assume that this compound is a solubilizer.

In the reaction medium of Blizzard et al., it is evident that the pentaerythritol tetra-acrylate acts as the multifunctional acrylate. In addition to forming a Michael adduct with the amine alcohol, the pentaerythritol tetra-acrylate acting as part of the Michael adduct will undergo copolymerization the tetra-alkoxysilane hydrolyzate, thereby resulting in the formation of the silicone resin as opposed to mono-dispersed polysilicic acid particles. See, e.g., column 6, lines 54-62.

The rejection asserts that based on the disclosures of Trau et al. and Blizzard et al., ammonia and ethanolamine are functionally equivalent. However, nothing within the rejection indicates that either Trau et al. or Blizzard et al. teach that ammonia and ethanolamine are functionally equivalent. The process of Blizzard et al. is clearly different than that of Trau et al. resulting in a different product. The Blizzard et al. disclosure clearly does not suggest that the alcohol amines disclosed therein are equivalent to a base used in a completely different process, such as the process disclosed by Trau et al. Neither Trau et al. nor Blizzard et al. disclose that ammonia and ethanolamine are equivalent bases for any particular use.

Further, it is noted that bases are not “equivalent” for the process of appellants’ claimed invention. See, for example, the results of appellants’ Example 1, presented in Table 1 at page 15 of the specification. While ethanolamine and ethylenediamine provided monodisperse particles, other amines like triethylamine, octylamine, and tetramethyl-ammonium hydroxide did not.

In the Advisory Action of October 1, 2009, the Examiner argues that “ethanolamine and ammonia impart similar effects and properties.” Appellants disagree. The function of ethanolamine in the process of Blizzard et al. as an agent for forming a Michael adduct is different than the function of ammonia in the Stober process described by Trau et al. Furthermore, the formation of the Michael adduct in the process of Blizzard et al. results in the formation of a very different product than the product produced by the Stober process described by Trau et al. As for the Trau et al. inventive process, it is noted that this process utilizes an acid, not a base like ammonia.

Regarding the results in appellants' Table 1, the Advisory Action asserts that mono-dispersed particles can be obtained using ammonia. The use of ammonia has many disadvantages as discussed in appellants' specification. See pages 2-3. In any event, the results in appellants' Table 1 show that bases are not "equivalent" for the process of appellants' claimed invention.

In the Advisory Action of October 1, 2009, the Examiner argues that "Blizzard et al., as clearly shown, was used for their teaching on the use of ethanolamine in a very similar process." However, the processes of Trau et al. and Blizzard et al. are very different. The Stober process described by Trau et al. is directed to the production of polysilicic acid particles by hydrolytic polycondensation. The process of Blizzard et al. is directed to the production of a radiation-curable silicone resin composition. The process of Blizzard et al. involves the use of a multifunctional acrylate to form a Michael adduct. The Stober process described by Trau et al. does not use a multifunctional acrylate and does not form a Michael adduct. The Stober process described by Trau et al. uses ammonia as the main component in a hydrolytic polycondensation. The process of Blizzard et al. uses an amine alcohol to form a Michael adduct with a multifunctional acrylate.

It is also argued in the Advisory Action of October 1, 2009 that "one cannot show non-obviousness by attacking references individually where the rejections are based on the combinations of references." Appellants are not attacking the references individually, but are instead presenting arguments why one skilled in the art would not combine the disclosures and why one skilled in the art would not modify the process of the primary reference, based on the disclosure of the secondary reference, in the manner suggested by the rejection.

Further, it is argued in the Advisory Action of October 1, 2009 that, to be used in a rejection, the prior art reference must be in the same field of endeavor as applicants' invention or be reasonably pertinent to the particular problem. The Blizzard et al. disclosure is not in the relevant field of endeavor in that it is not related to the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes. Further, the formation of a Michael adduct, as described by Blizzard et al., is not reasonably pertinent to appellants' particular problem, or that of Trau et al.

Responding to appellants' argument that Blizzard et al. do not employ pentaerythritol

tetra-acrylate as a solubilizer, the Advisory Action asserts that this compound would be “expected to impart the same effect and have the same properties.” However, neither Trau et al. nor Blizzard et al. disclose the compound as a solubilizer. Thus, these two disclosures do not provide an expectation as to this effect.

As a final note, appellants disagree with the assertion that, because Trau et al. allegedly do not expressly disclose that their particles are porous, one can definitively conclude that the particles produced by Trau et al. are non-porous. See the bottom of page 16 of the March 17, 2009 Office Action. **In fact, Trau et al. expressly disclose that their particles are porous.** See, e.g., paragraphs [0021] and [0025].

In view of the above remarks, it is respectfully submitted that the disclosure of Trau et al., taken alone or in combination with the disclosure by Blizzard et al., fails to render obvious appellants’ claimed invention.

#### **VI. Rejection under 35 USC 103(a) in view of Trau et al., Blizzard et al. and Anselmann et al.**

Claim 2 is rejected as being obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564), Blizzard et al. (US 5,626,964), and Anselmann et al. (US 6,302,926). This rejection is respectfully traversed.

The disclosures of Trau et al., Blizzard et al. and Anselmann et al. are discussed above. Anselmann et al. do not disclose a process wherein hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes is performed in a medium comprising water, one or more solubilizers, and an amine, namely ethanolamine. Nor do Anselmann et al. suggest metered addition of tetraalkoxysilane in a process involving hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes in the presence of ethanolamine.

As noted above, Anselmann et al. use an aqueous-alcoholic-ammoniacal medium which has several disadvantages as described in appellants’ specification. See, e.g., page 2, lines 13-30.

Additionally, the disclosure of Anselmann et al. does not overcome the deficiencies in the combination of Trau et al. and Blizzard et al., as discussed above.

In view of the above remarks, it is respectfully submitted that the disclosure of Trau et



al., taken alone or in combination with the disclosure by Blizzard et al. and/or Anselmann et al., fails to render obvious appellants' claimed invention.

**VII. Rejection under 35 USC 103(a) in view of Trau et al., Blizzard et al. and Teller et al.**

Claim 19 is rejected as being obvious under 35 USC 103(a) in view of Trau et al. (US 2003/0124564), Blizzard et al. (US 5,626,964), and Teller et al. (EP 1 036 763). This rejection is respectfully traversed.

The disclosures of Trau et al., Blizzard et al., and Teller et al. are discussed above. In the rejection, it is asserted that it would be obvious to use the material from the combination of Trau et al. and Blizzard et al. in any of the applications recited in appellants' claim 19 "such as a solid phase for the investigation of molecular recognition phenomena as that taught by Teller et al."

Since the Teller et al. document is in German and no English translation is provided, appellants' counsel can not comment on this assertion.

In any event, the disclosure of Teller et al. does not overcome the deficiencies in the combination of Trau et al. and Blizzard et al., as discussed above.

In view of the above remarks, it is respectfully submitted that the disclosure of Trau et al., taken alone or in combination with the disclosure by Blizzard et al. and/or Teller et al., fails to render obvious appellants' claimed invention.

**VIII. Rejection under 35 USC 103(a) in view of Unger et al. and Blizzard et al.**

Claims 1, 2, 7-9, 17-19, and 22-23 are rejected as being obvious under 35 USC 103(a) in view of Unger et al. (US 4,775,520) and Blizzard et al. (US 5,626,964).

Firstly, it is noted that this rejection as presented in the Final Office Action of March 17, 2009 was not applied against claim 4. However, in light of the arguments presented in that Office Action and the reliance on the Blizzard et al. reference, it appeared that claim 4 was intended to be rejected as well. For the sake of furthering prosecution, appellants assumed in the Reply filed September 17, 2009 that the rejection was applied to claim 4.

A. Unger et al. (US 4,775,520)

Unger et al. disclose a method for the preparation of spherical SiO<sub>2</sub> particles by hydrolytic polycondensation of tetralkoxysilanes in an aqueous/alcoholic ammoniacal medium. In a first step, a sol of primary particles is produced. Then, the SiO<sub>2</sub> particles obtained are converted to the desired size by a continuous measured addition of tetralkoxysilane. See, for example, column 3, lines 5-16.

Unger et al. do not disclose a process wherein hydrolytic polycondensation of tetralkoxysilanes and/or organotrialkoxysilanes is performed in a medium comprising water, one or more solubilizers, and ethanolamine.

B. Blizzard et al. (US 5,626,964)

The disclosure of Blizzard et al. is discussed above. Blizzard et al. is directed to the formation of a radiation curable silicone resin from an amine alcohol, a tetralkoxysilane, and a multifunctional acrylate. Blizzard et al. is not directed to the formation of mono-dispersed polysilicic acid particles, and therefore provides no indication as to how or why one would modify a process for the production mono-dispersed polysilicic acid particles.

Furthermore, the disclosure of Blizzard et al. teaches the use of an amine alcohol as an agent for forming a Michael adduct with a multifunctional acrylate. However, the Unger et al. reaction medium does not contain a multifunctional acrylate. Therefore, Blizzard et al. provide no suggestion of modifying the process of Unger et al. so as to use an amine alcohol in the reaction medium.

Additionally, in the rejection it is asserted that Blizzard et al. disclose the use pentaerythritol tetra-acrylate (see, e.g., Example 1), and that this compound is a ketone and therefore a solubilizer. However, Blizzard et al. do not employ pentaerythritol tetra-acrylate as a solubilizer, and one of ordinary skill in the art upon reading the disclosure of Blizzard et al. would not assume that this compound is a solubilizer. In the reaction medium of Blizzard et al., it is evident that the pentaerythritol tetra-acrylate acts as the multifunctional acrylate. In addition to forming a Michael adduct, with the amine alcohol, the pentaerythritol tetra-acrylate, acting as part of the Michael adduct will undergo copolymerization with the tetralkoxysilane hydrolyzate, thereby resulting in the formation of the silicone resin as opposed to mono-dispersed polysilicic acid particles. See, e.g., column 6, lines 54-62.

The rejection asserts that based on the disclosures of Unger et al. and Blizzard et al., ammonia and ethanolamine are functionally equivalent. However, nothing within the rejection indicates that either Unger et al. or Blizzard et al. teach that ammonia and ethanolamine are functionally equivalent. The process of Blizzard et al. is clearly different than that of Unger et al. resulting in a different product. The Blizzard et al. disclosure clearly does not suggest that the alcohol amines disclosed therein are equivalent to a base used in a completely different process, such as the process disclosed by Unger et al. Neither Unger et al. nor Blizzard et al. disclose that ammonia and ethanolamine are equivalent bases for any particular use.

Further, it is noted that bases are not “equivalent” for the process of appellants’ claimed invention. See, for example, the results of appellants’ Example 1, presented in Table 1 at page 15 of the specification. While ethanolamine and ethylenediamine provided monodisperse particles, other amines like triethylamine, octylamine, and tetramethylammonium hydroxide did not.

In the Advisory Action of October 1, 2009, the Examiner argues that “ethanolamine and ammonia impart similar effects and properties.” Appellants disagree. The function of ethanolamine in the process of Blizzard et al. as an agent for forming a Michael adduct is different than the function of ammonia in the Unger et al. process. Furthermore, the formation of the Michael adduct in the process of Blizzard et al. results in the formation of a very different product than the product produced by the Unger et al. process.

Regarding the results in appellants’ Table 1, the Advisory Action asserts that monodispersed particles can be obtained using ammonia. The use of ammonia has many disadvantages as discussed in appellants’ specification. See pages 2-3. In any event, the results in appellants’ Table 1 show that bases are not “equivalent” for the process of appellants’ claimed invention.

In the Advisory Action of October 1, 2009, the Examiner argues that “Blizzard et al., as clearly shown, was used for their teaching on the use of ethanolamine in a very similar process.” However, the processes of Unger et al. and Blizzard et al. are very different. The Unger et al. process is directed to the production of polysilicic acid particles by hydrolytic polycondensation. The process of Blizzard et al. is directed to the production of a radiation-curable silicone resin composition. The process of Blizzard et al. involves the use of a

multifunctional acrylate to form a Michael adduct. The Unger et al. process does not use a multifunctional acrylate and does not form a Michael adduct. The Unger et al. process uses ammonia as the main component in a hydrolytic polycondensation. The process of Blizzard et al. uses an amine alcohol to form a Michael adduct with a multifunctional acrylate.

It is also argued in the Advisory Action of October 1, 2009 that “one cannot show non-obviousness by attacking references individually where the rejections are based on the combinations of references.” Appellants are not attacking the references individually, but are instead presenting arguments why one skilled in the art would not combine the disclosures and why one skilled in the art would not modify the process of the primary reference, based on the disclosure of the secondary reference, in the manner suggested by the rejection.

Further, it is argued in the Advisory Action of October 1, 2009 that, to be used in a rejection, the prior art reference must be in the same field of endeavor as applicants’ invention or be reasonably pertinent to the particular problem. The Blizzard et al. disclosure is not in the relevant field of endeavor in that it is not related to the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes. Further, the formation of a Michael adduct, as described by Blizzard et al., is not reasonably pertinent to appellants’ particular problem, or that of Unger et al.

Responding to appellants’ argument that Blizzard et al. do not employ pentaerythritol tetra-acrylate as a solubilizer, the Advisory Action asserts that this compound would be “expected to impart the same effect and have the same properties.” However, neither Unger et al. nor Blizzard et al. disclose the compound as a solubilizer. Thus, these two disclosures do not provide an expectation as to this effect.

In view of the above remarks, it is respectfully submitted that the disclosure of Unger et al., taken alone or in combination with the disclosure by Blizzard et al., fails to render obvious appellants’ claimed invention.

**IX. Rejection under 35 USC 103(a) in view of Unger et al., Blizzard et al., and Trau et al.**

Claims 10-16 and 24-26 are rejected as being obvious under 35 USC 103(a) in view of Unger et al. (US 4,775,520), Blizzard et al. (US 5,626,964), and Trau et al. (US

2003/0124564). This rejection is respectfully traversed.

The disclosures of Unger et al., Blizzard et al., and Trau et al. are discussed above. In the rejection, it is asserted that it would be obvious to modify the material from the combination of Unger et al. and Blizzard et al. to incorporate a fluorescent dye in view of the disclosure of Trau et al. However, the disclosure of Trau et al. does not overcome the deficiencies in the combination of Unger et al. and Blizzard et al., as discussed above.

In view of the above remarks, it is respectfully submitted that the disclosure of Unger et al., taken alone or in combination with the disclosure by Blizzard et al. and/or Trau et al., fails to render obvious appellants' claimed invention.

### **(8) CONCLUSION**

For all of the above reasons, it is urged that the decision of the Examiner finally rejecting claims 1, 2, and 6-28, on appeal, is in error and should be reversed.

Respectfully submitted,

/Brion P. Heaney/

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Brion P. Heaney  
Registration No. 32,542

Filed: November 17, 2009

## **CLAIMS APPENDIX**

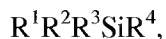
### **Listing of Claims:**

1. (Previously Presented): A process for the production of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles by hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes, said process comprising:  
conducting said hydrolytic polycondensation of tetraalkoxysilanes and/or organotrialkoxysilanes in a medium comprising water, one or more solubilizers, and ethanolamine.
2. (Previously Presented): A process according to Claim 1, wherein a sol of primary particles is first produced, and the resultant SiO<sub>2</sub> particles are subsequently brought to the desired particle size in such a way that further nucleation is prevented by continuous metered addition of corresponding silane controlled to the extent of reaction.
6. (Previously Presented): A process according to Claim 1, wherein the proportion of ethanolamine in the medium is from 0.1 to 5% by weight.
7. (Previously Presented): A process according to Claim 1, wherein the one or more solubilizers are in each case an alcohol, a ketone, a dialkyl sulfoxide, a pyrrolidone, an alkyl nitrile, a furan, or a dioxane.
8. (Previously Presented): A process according to Claim 1, wherein the alkoxy group of the tetraalkoxysilane is in each case a methoxy, ethoxy, propoxy, butoxy or pentoxy group.
9. (Previously Presented): A process according to Claim 1, wherein the hydrolytic polycondensation is carried out at temperatures between 25 and 78°C.
10. (Previously Presented): A process according to Claim 1, wherein one or more

dyes are additionally added to the medium during the hydrolytic polycondensation.

11. (Previously Presented): A process according to Claim 10, wherein said dye is a fluorescent dye.

12. (Previously Presented): A process according to Claim 10, wherein said dye is a terminally silylated fluorescent dye of the formula:



in which

$R^1$ ,  $R^2$  and  $R^3$  are identical or different and stand for halogen atoms, alkyl, aryl, alkoxy or silyloxy groups,

$R^4$  has the complex structure  $A^1-B_m-C_n-A^2$ ,

m and n are each zero or 1,

$A^1$  is an alkylene chain or a heteroanalogous structure,

B is a functional sequence,

C is a bifunctional organic sequence having a chain or ring structure which is linked to  $A^2$ , and

$A^2$  is a fluorophoric system or a dye molecule which is bonded to C or, if n is equal to zero, is bonded to B or, if m and n are both equal to zero, is bonded to  $A^1$ .

13. (Previously Presented): A process according to Claim 12, wherein the functional sequence B in  $R^4$  is carbonyl, oxycarbonyl, aminocarbonyl, aminothiocarbonyl, or a hetero atom.

14. (Previously Presented): A process according to Claim 12, wherein the bifunctional sequence C in  $R^4$  is an alkylene unit, a substituted alkylene unit, or a heteroanalogous alkylene unit, which in each case is linked to  $A^2$  via a carbon, nitrogen, oxygen or sulfur atom.

15. (Previously Presented): A process according to Claim 12, wherein the bifunctional sequence C in  $R^4$  is a hydroxy- or aminocarboxylic acid radical, or an ester or

amide thereof.

16. (Previously Presented): A process according to Claim 12, wherein the alkoxy group is a methoxy, ethoxy, propoxy, butoxy or pentoxy group.

17. (Previously Presented): A powder consisting of mono-dispersed, spherical, nonporous SiO<sub>2</sub> particles obtainable by a process according to Claim 1.

18. (Previously Presented): A powder according to Claim 17, wherein the SiO<sub>2</sub> particles have a mean particle diameter of between 0.05 and 10 µm.

19. (Previously Presented): A material for use as sorption material in chromatography, in isolation and purification of nucleic acids and proteins, in phagocytosis analyses, as constituents in diagnostic arrays, as solid phases for the investigation of molecular recognition phenomena, as solid phases in heterogeneously catalysed processes, as a component of photonic crystals, or as lubricants and/or polishing agents, wherein said material is a product obtained by the process according to claim 1.

20. (Previously Presented): A process according to Claim 1, wherein the proportion of ethanolamine in the medium is from 0.5 to 2% by weight.

21. (Previously Presented): A process according to Claim 1, wherein the proportion of ethanolamine in the medium is from 0.5 to 3% by weight.

22. (Previously Presented): A process according to Claim 1, wherein the hydrolytic polycondensation is carried out at temperatures between 30 and 75°C

23. (Previously Presented): A process according to Claim 1, wherein the hydrolytic polycondensation is carried out at temperatures between 40 and 55°C.

24. (Previously Presented): A process according to Claim 13, wherein the



functional sequence B in R<sup>4</sup> is carbonyl, oxycarbonyl, aminocarbonyl, aminothiocarbonyl, oxygen, nitrogen or sulfur.

25. (Previously Presented): A process according to Claim 12, wherein m is 1, and the functional sequence B in R<sup>4</sup> is carbonyl, oxycarbonyl, aminocarbonyl, aminothiocarbonyl, or a hetero atom.

26. (Previously Presented): A process according to Claim 12, wherein n is 1, and the bifunctional sequence C in R<sup>4</sup> is a hydroxy- or aminocarboxylic acid radical, or an ester or amide thereof.

27. (Previously Presented): A process according to Claim 1, wherein said medium contains 2 – 25 % by weight water, 0.1-5 % by weight ethanolamine, 70-90 % by weight solubilizers, and 2-40 % by weight tetraalkoxysilane, based on the total weight of the medium.

28. (Previously Presented): A process according to Claim 1, wherein said medium contains 2 – 25 % by weight water, 0.5-3 % by weight ethanolamine, 70-90 % by weight solubilizers, and 5-15 % by weight tetraalkoxysilane, based on the total weight of the medium.

## **EVIDENCE APPENDIX**

Not Applicable.

## **RELATED PROCEEDINGS APPENDIX**

Not Applicable.